Report No. 77-3-19

March 1977

EVALUATION OF SOUTHERN PINE BEETLE INFESTATIONS ON THE MENA AND CADDO RANGER DISTRICTS, OUACHITA NATIONAL FOREST, ARKANSAS

By

James D. Ward, Charles W. Dull and Robert F. Bassett

INTRODUCTION

An aerial and ground survey of southern pine beetle infestations was conducted on the Mena and Caddo Districts of the Ouachita National Forest during February and March 1977 by the Aerial Survey Team, Insect and Disease Management Unit.

Outbreaks of southern pine beetle probably occurred in this part of Arkansas during the early 1900's but there is no specific reference to any infestation occurring in the area of the Mena and Caddo Ranger Districts. There is currently an outbreak in Arkansas which began in Ashley County during 1969 (Ward and Drake, 1969) and now involves about 20 counties south of the Ouachita National Forest. During January 1977 personnel of the Arkansas Forestry Commission observed several spots of dying pine trees which were suspected to be southern pine beetle infestations near the Polk/Howard County line. This survey was conducted to confirm the presence of southern pine beetle in this area and to determine the extent and potential of its infestations.

METHODS

Standard aerial sketchmap procedures were used for this survey[1]. Approximately 90 percent of the area was observed on the aerial survey. Spots of red and fading pines were plotted on Forest Service Class A maps for later examination on the ground. Aerial survey results were corrected according to the data of Aldrich, et. al. (1958) to compensate for observer error

---

1/ Detection of Forest Pests in the Southeast. 1970. U.S.D.A., USFS SA, S&PF, Div. of FPM, Pub. S&PF-7, Atlanta, GA. 51 pp.

Four spots were ground checked on the Caddo and three were checked on the Mena to determine the cause of mortality and to determine the condition of the brood. Measurements of stand characteristics such as basal area, tree height, and diameter were made to determine the stocking and the volume of timber affected.

TECHNICAL INFORMATION

Insect - The southern pine beetle, *Dendroctonus frontalis* Zimm. is a dark reddish brown to black beetle about 2.2 to 4.2 mm. long. Eggs are oval, pearly white in color and about 1.5 mm. long and 1 mm. wide. Larvae are white, legless, grublike worms about 2 to 5 mm. long. They have reddish head capsules and curved bodies.

Host - Southern pine beetle is a native forest pest that will attack all species of southern yellow pine. The species of pine most susceptible to attack on the Ouachita National Forest are shortleaf *(Pinus echinata* Mill.) and loblolly *(Pinus taeda* L.).

Type of Damage - This insect causes death of a tree by mining in the cambium as it constructs egg galleries. The beetle also introduces blue stain fungi, *Ceratocystis* spp., which slow down or block water conduction in the stem. Individual infestations may range in size from a single tree to several thousand trees.

Life Cycle of the Beetle - Adult beetles may attack trees in mass during the spring, summer and fall months on the Ouachita National Forest. Very little beetle activity will occur during the winter in this area. The adult bores into the tree and constructs winding S-shaped egg galleries in the cambium. Eggs, deposited in niches in the walls of the galleries, hatch into grubs that feed in the cambium. When fully developed, the larvae mine to the outer bark where they pupate and transform to adults. The newly emerged adults chew their way to the outside, fly to and attack green trees.

The complete life cycle takes about 30 days during the summer. There may be as many as 3-5 generations produced annually on the Ouachita National Forest.

RESULTS AND DISCUSSION

Results of this survey confirmed the presence of southern pine beetle activity on the Mena and Caddo Districts. The aerial survey showed twelve spots on the Mena Ranger District and eleven on the Caddo Ranger District (Table 1). Beetle activity is probably scattered throughout the districts but the current survey showed most of the spots occurring in the southern part of the survey area (Fig. 1). The full extent of the beetle infestations should become more evident during the spring and summer. Spots detected on the aerial survey were small, ranging in size from 1 to 9 trees.

All of the seven spots which were ground checked had been attacked by southern pine beetle. Six of the infestations were active at the time of the ground evaluation. Bark samples taken in five of the sites showed that 50% of the brood had been killed by cold weather. However, healthy brood were found in all six of the active infestations. The largest spot contained forty infested trees.

Factors predisposing the stands to southern pine beetle attack were evident in all of the spots ground checked. Five infestations developed in lightning struck trees. Lightning struck trees are highly susceptible to attack from the southern pine beetle and have been recognized for several years as an important factor in sustaining the southern pine beetle when population levels are low (Thatcher and Pickard, 1964, Hodges and Pickard, 1971). Most of the single-tree spots on these districts probably resulted from lightning strikes.

The other two infestations occurred in pine stands with basal areas of 150 and 160 square feet per acre. Research has shown that pine stands with high basal areas are more susceptible to beetle attack and that infestations occurring in these stands are more likely to increase in size than those in stands with low basal areas (Coulson, et. al., 1974, Ku, et. al., 1976, Lorio, 1968, Hedden, 1976). Ground examination on the current survey found that the largest infestations occurred in the stands with the highest basal area.

Based on the results of this survey there is a high potential for an increase in the southern pine beetle population on the Mena and Caddo Ranger Districts in 1977.

Table 1. Summary of results of southern pine beetle evaluation, Mena and Caddo Ranger Districts, Ouachita National Forest, March 1977.

	Mena Ranger District	Caddo Ranger District
1. Results compiled from data collected during the aerial phase of the evaluation:		
Survey type	Aerial Sketchmap	Aerial Sketchmap
Date of aerial survey	2/16/77	2/16/77
Percent survey	90%	90%
Total acreage of Forest Service land	159,000	129,000
Susceptible host type acreage of Forest Service land	133,000	102,000
Total number of spots on Forest Service lands	12.2	11.2
Spots per M acre of host type Forest Service lands	.09	.11
Average spot size (trees) Forest Service lands	4.7	2.5
Range of spot sizes (trees) Forest Service lands	1-9	1-8
Reds and faders/M acres host type on Forest Service lands	.4	.3
2. Results compiled from data collected during the ground and aerial phases of the evaluation:		
Date of ground phase	3/2/77	
Infested trees per M acre of host type Forest Service lands	.4	.4
Total number of infested trees on Forest Service lands	55	38
Total volume of infested trees on Forest Service lands	4.6 MBF	2.7 MBF
Total number of affected trees on Forest Service lands	58	40
Total volume of affected trees on Forest Service lands	4.9 MBF	3.4 MBF
Ratio of green infested to total red and fading trees	.06:1	.21:1

Volume - BF - based on Scribner decimal C log rule. Cords converted to bd. ft. based on 500 bd. ft. per cord.
Corrected to 100% - Adrich et. al.

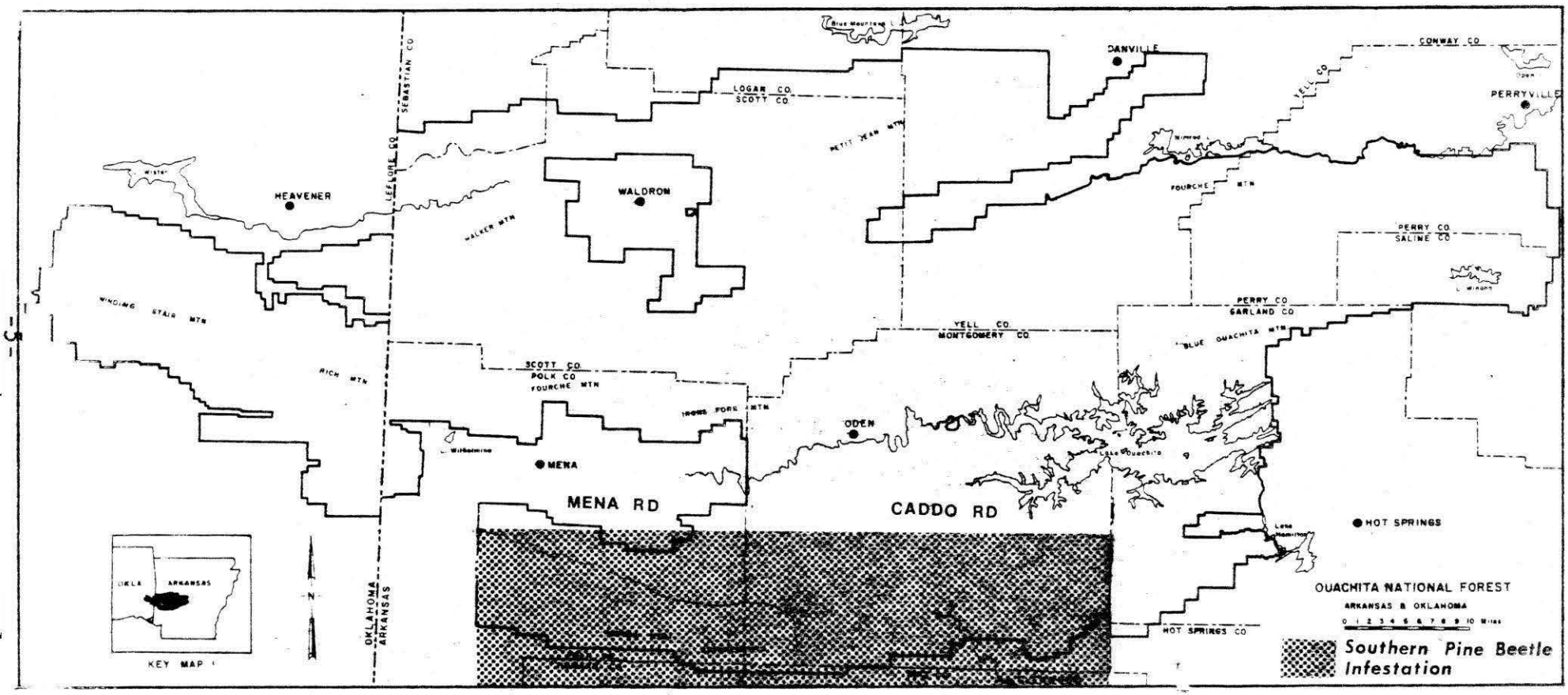

Fig. 1. Location of southern pine beetle infestations on the Mena and Caddo Ranger Districts, Ouachita National Forest March 1977.

Factors supporting this prediction include; (1) an abundance of host type in the area (2) a large number of overstocked pine stands (3) the presence of healthy brood in most of the infestations and (4) widely distributed beetle spots in the area. Also experience has shown that populations in newly infested areas generally have a high potential for increase because natural control agents such as parasites and predators are not as plentiful as they are in older infestations.

RECOMMENDATIONS

Based on observations made during the survey there is a strong potential for the development of a severe outbreak of southern pine beetle on the Mena and Caddo Ranger Districts. In order to reduce timber losses it is recommended that the Districts initiate suppression action as soon as possible. Every effort should be made to locate all of the infestations on the districts. There are few spots at this time and they are small enough so that direct control action is feasible. However, the land manager should also consider long term prevention of southern pine beetle outbreak by silvicultural treatment such as thinning overstocked stands.

Any control action taken should follow the procedures outlined in FSM-5250.

1. Removal of Infested Trees by Commercial Sale or Administrative Use. When infested trees of merchantable size are accessible, they should be removed by commercial sale or administrative use procedures. Logging of the infested material should begin immediately. Contract time limits should insure rapid removal.

   Where practical, and if host type is present, a 40- to 70-foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. This practice is effective in reducing the possibility of "breakouts." When only a small volume of infested merchantable material occurs in a spot, non-infested trees surrounding the spot may be marked to provide an operable cut.

The order of priority for removing beetle infested timber from a spot should be as follows:

Trees having nearly developed broods (usually the red and fading trees).

Trees having young broods (usually the green, recently infested trees).

Trees in the buffer zone.

2. Piling and Burning. Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly burning the bark of infested trees. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly the large spots, is the same as paragraph (1) under removal of infested trees by commercial sale or administrative use. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts" every effort should be made to locate and treat all green infested trees during the piling and burning operation.

3. Chemical Control. Chemical formulation recommended for southern pine beetle control is a 1/2 percent lindane spray with No. 2 fuel oil as the carrier. This may be formulated from a 20 percent lindane emulsifiable concentrate or oil concentrate at the rate of 11 pints of concentrate in enough fuel oil to make 55 gallons of spray. (Ratio of one part 20 percent lindane EC to 39 parts No. 2 diesel fuel).

   Cut, limb, and buck all infested trees into workable lengths. Spray the infested bark surface to the point of run-off. A compressed air sprayer (3-gallon capacity or equivalent) is an ideal applicator. Infested logs must be turned two or three times to insure complete treatment of infested bark. Spray stumps and bark removed by woodpeckers. Low pressure sprayers may be used to treat large, accessible infestations.

   The order of priority for cutting and spraying infested trees in large spots is the same as paragraph (1) under removal of infested trees by commercial sale or administrative use. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts" every effort should be made to locate and treat all green infested trees during the chemical control operation.

Never spray trees from which southern pine beetle brood has emerged. Natural enemies of the southern pine beetle in these trees can then complete their development. To prevent aerial spotters from mapping treated spots, cut trees with red needles from which beetles have emerged.

Instructions for minimizing the adverse effects of mixing, transporting and storing pesticides, applying pesticides and disposing of pesticide containers and excess chemicals are outlined in section 8.3 of the Forest Service Health and Safety Code and FSM 5252.21. Detailed safety procedures should be outlined in the project suppression plan.

4. Reexamination of Treated Areas. Reexamine areas where infested trees were removed by commercial sales, piled and burned, or chemically treated within two or three weeks after treatment to check for additional infested trees. If additional trees are found, treat them.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays of dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.

REFERENCES

Aldrich, R. C., R. C. Heller, and W. F. Bailey. 1958. Observation limits for aerial sketch-mapping southern pine beetle damage in southern Appalachians. J. For. 56:200-205.

Coulson, R. N., F. P. Hain, and T. L. Payne. 1974. Radial growth characteristics and stand density of loblolly pine in relation to the occurrence of the SPB. Environ. Ent. 3:425-428.

Hedden, R. L. 1976. Southern pine beetle spot growth and inactivity in east Texas. (Unpubl.)

Hodges, J. D. and L. S. Pickard. 1971. Lightning in the ecology of the southern pine beetle, *Dendroctonus frontalis* (Coleoptera:Scolytidae). Can. Ent. 103:44-51.

Ku, T. T., J. Sweeney, and V. Shelburne. 1976. Preliminary evaluation of site and stand characteristics associated with SPB infestations in Arkansas. Arkansas Farm Research 5:25.

Lorio, P. L. 1968. Soil and stand conditions related to SPB activity in Hardin County, Texas. J. Econ. Ent. 61:565:566.

Thatcher, R. C. and L. S. Pickard. 1964. Seasonal variations in activity of the southern pine beetle in East Texas. J. Econ. Ent. 57:840-842.

Ward, J. D. and L. E. Drake. 1969. Southern pine beetle detection survey in Ashley County Arkansas. USDA Forest Service, Division of Forest Pest Control, Pineville, La. Rpt. No. 69-2-43.

For any additional information, Contact:
Forest Insect and Disease Management Unit
Southeastern Area, State & Private Forestry
Northgate Office Park, Room 2103
3620 Interstate 85, N.E.
Doraville, Georgia 30340
Telephone 404-221-4796